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(54) Imposition proofing

(57) An imposition proofing printing sheet, printer, punch, and method are disclosed which make use of suitable registration openings in paper to enable accurate and simple friction feeding, as opposed to the conventional method in imposition proofing of tractor and imposition proofing sheet. This may facilitate handling without compromising quality.

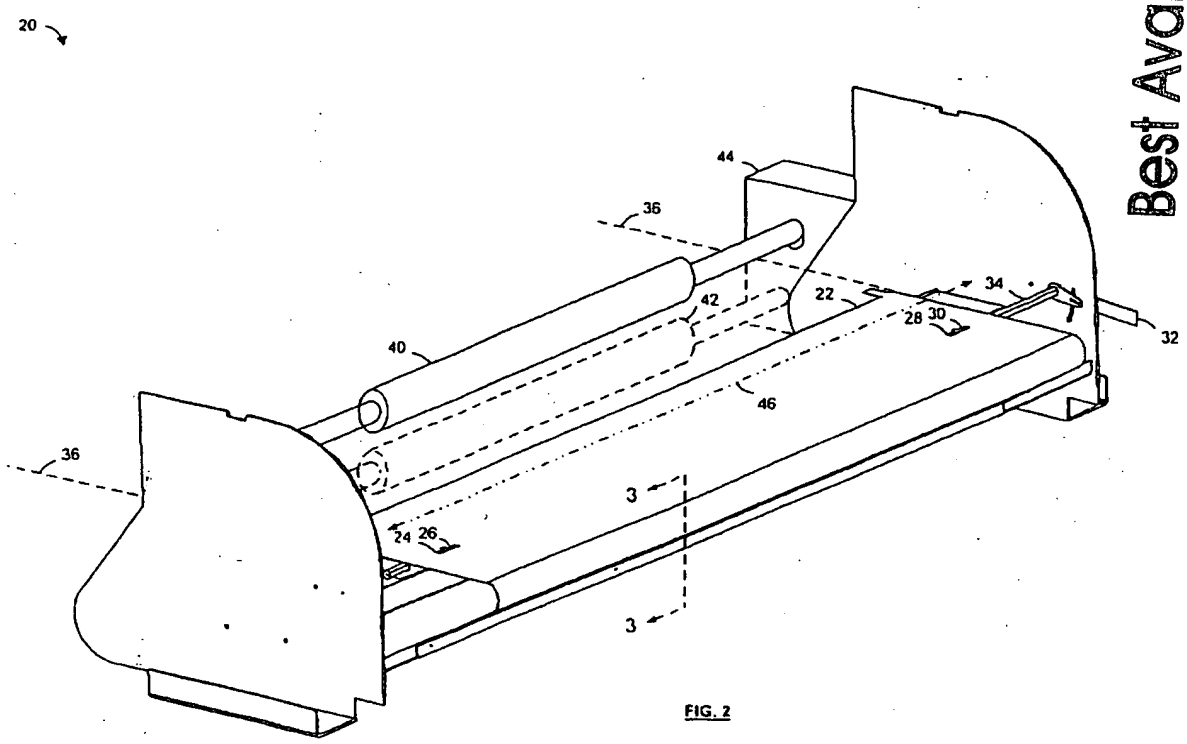

FIG. 2

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Description

[0001] This invention relates to imposition proofing and printing stock for imposition proofing.

[0002] High volume printing of books, brochures, and other multi-page documents typically involves imposition. Imposition is the process of laying out the pages of a document such that they are in numerical order after a larger printed sheet, known as a signature, has been folded into multiples of four pages that make up a section of the document. Before printing the signatures with high-volume, double-sided printers, it is common practice to print a set of proofs using an imposition proofing printer.

[0003] Imposition proofing printers are highly specialised printers, being required to handle relatively large sheets of paper and print with highly accurate alignment. Conventional imposition proofing printers are typically relatively large, single-sided, tractor-type, ink-jet printers. These printers first print one side of a signature on a large sheet of tractor-type paper. An operator then turns the paper over and threads it back onto the printer's tractor feed mechanism so that the printer can print the other side.

[0004] Printers that employ tractor-feed-type paper have the advantage that the presence of multiple tractor holes in the paper can allow reliable alignment. A problem with tractor feed printers, however, is that they may be cumbersome to load, and require specially made tractor-type paper, of which the edges are unusable and must be trimmed or removed. Friction feed printers with edge guides are in general use for printing smaller documents,and are easier to load, but are only suitable for applications in which side-to-side alignment is not critical or in which the printing medium is dimensionally stable. Neither of these methods has been used entirely successfully for the specialised application of imposition proofing.

[0005] In one general aspect, the invention features a deposited ink drop imposition proofing print sheet that includes a first rectangular deposited ink drop printable face having a periphery defined by an ordered series of first, second, third, and fourth edges of the imposition proofing print sheet, the first face including an added deposited ink drop print-enhancing composition and a second rectangular deposited ink drop printable face opposite the first face. The second face also has a periphery defined by the first, second, third, and fourth edges of the imposition proofing print sheet and includes an added deposited ink drop print-enhancing composition. The sheet defines a first registration opening located closer to the first sheet edge than to the third sheet edge and closer to the second sheet edge than to the fourth sheet edge. The sheet also defines a second registration opening located closer to the first sheet edge than to the third sheet edge and closer to the fourth sheet edge than to the second sheet edge.

[0006] Thus, by providing such registration openings, the paper can be accurately aligned, enabling subsequent friction feeding to be performed accurately.

[0007] The registration openings are preferably located adjacent the first edge, and preferably the openings are open-ended cut outs opening onto the first edge; this enables the paper to be slid up against corresponding registration stops for loading.

[0008] The paper preferably has a printable area substantially free of registration openings, preferably occupying a major portion of the length and width of the paper, preferably substantially the entire width (between the second and fourth edges). Preferably, registration openings are provided in a margin area, preferably adjacent the first edge only of the paper, the remainder of the paper preferably being substantially free of openings. Preferably the paper is arranged for friction feeding and is preferably free of tractor feed holes. Preferably, the registration openings are located adjacent the leading edge of the paper; this facilitates alignment as the paper is loaded.

[0009] Preferably the distance between the registration openings is less than the width of the printable area; in contrast with tractor type paper, where holes are located either side of the printable area, this allows a more substantial margin outside the registration openings to be provided without excess waste paper. Preferably the separation between the openings is at least about 85% of the width of the paper, for example at least about 90cm (36 inches) for paper that is about 1m (42 inches) wide. Preferably the openings are substantially symmetrically disposed about the centre of the first edge; this enables the paper to be used on both sides with the same registration stops. Preferably the width of at least one registration opening is sufficient to accommodate changes in dimensions of the paper due to changes in humidity, and preferably the openings are (although symmetrically disposed) of differing sizes. Preferably, the openings are sized to accommodate changes in size between a relative humidity of about 20% and about 80% (or a tolerance of about +/- 30% about a nominal relative humidity of about 50%). Preferably one opening is about 6 or 7mm wide (1/4 inch) and the other is about 20mm wide (3/4 inch). Both openings preferably have substantially the same depth, preferably about 6 or 7 mm (1/4 inch). These dimensions are ideal to ensure accurate and easy alignment with minimal risk of tearing, and tolerance of dimensional changes.

[0010] The invention is most advantageously applied to paper substantially in excess of the size of A3 paper, for example having a width (with respect to the feed path width) of at least about 75cm (30 inches), ideally about 1m (42 inches). Ideally, the paper has a printable area having a length of about 75cm (30 inches) and a margin area containing the registration openings of about another 10cm - 15cm (5 inches). Further registration openings may be provided preferably an even number, although preferably only a pair of openings is provided adjacent the leading edge (or each edge which has regis-

tration openings).

[0011] In preferred embodiments, the width of the second registration opening can be greater than the width of the first registration opening, in a direction parallel to the first edge of the imposition proofing sheet. The width of the second registration opening can exceed the width of the first registration opening by about the range of dimensional change with humidity of the sheet between the first and second registration openings in a direction parallel to the first edge of the imposition proofing sheet. The sheet can define the first registration and second registration openings as openings that begin at the first sheet edge. The first and third edges can be at least 42 inches in length, with the second and third edges being at least 30 inches in length and with the first and second registration openings being peripheral to a 42 inch x 30 inch printable area of the sheet. The first and second registration openings can be (substantially) rectangular, and the first and second faces can be coated with the deposited ink drop print-enhancing composition (if the paper is suited to ink-drop printing, or if printing is dry, no additional coating may be required).

[0012] In an alternative but related aspect, the invention can provide a double-sided ink-jet printable friction-feed imposition proofing sheet having a printable area occupying substantially the width of the sheet, preferably at least about 75cm wide, and registration openings adjacent a leading edge of the sheet, the distance between the registration openings preferably being less than the width of the printable area, the registration openings preferably being substantially symmetrically disposed about the centre of the leading edge and opening to the leading edge.

[0013] In another general aspect, the invention features an imposition proofing printer that includes at least one feed roller located along a printing substrate feed path and having an axis of rotation, at least one pinch roller located along the printing substrate feed path and having an axis of rotation parallel to the axis of rotation of the feed roller, and a disengagement mechanism linked to one or more of the feed roller and the friction feed drum. A first retractable registration pin (which may comprise any suitable member such as a stop having a rectangular section) has an alignment surface located along the printing substrate feed path, and a second retractable registration pin has an alignment surface located along the printing substrate feed path and being spaced from the first retractable registration pin in at least a direction parallel to the axis of rotation of the feed roller. In preferred embodiments, the imposition proofing printer can further include a mechanism linking the first and second retractable stops (pins) and the disengagement linkage. The substrate feed path can be at least 30 inches wide.

[0014] Preferred features of the first aspect may of course be applied to the printer and other aspects to be described below, and vice versa.

[0015] In an alternative but related aspect, the invention may provide a friction-feed imposition proofing printer, preferably having a feed path width of at least about 75cm (30 inches), and first and second retractable registration pins spaced apart across the width of the feed path for registering with preformed registration openings of paper to be printed to align the paper, the printer preferably being arranged to register with the leading edge of paper to be printed and preferably wherein the printer has means for printing a printable area of greater width than the spacing of the pins.

[0016] In a further general aspect, the invention features an imposition printing method that includes the steps of disengaging rollers from a print substrate feed path, deploying a pair of registration stops in the print substrate feed path, aligning a print substrate in the print substrate feed path by engaging openings in the print substrate with respective ones of the pair of stops, engaging the rollers with the print substrate, and retracting the registration stops from the print substrate feed path. In preferred embodiments, the steps of disengaging and deploying can take place in unison, with the steps of engaging and retracting deploying take place in unison. The step of aligning can align a print substrate with registration openings of different widths, and the width of a second of the registration openings can exceeds a width of a first of the registration openings by about the range of dimensional change with humidity of the printing substrate between the first and second registration openings.

[0017] In an alternative but related aspect, the invention may provide an imposition proof printing method comprising aligning preformed registration openings adjacent a leading edge of double-sided imposition proofing printing paper in a first orientation with registration pins of a friction feed imposition proofing printer, friction feeding the paper through the printer to print the first side of the paper, the method preferably further comprising aligning the paper in a second orientation (preferably after removing and flipping the paper) and friction feeding the paper to print the second side of the paper.

[0018] The invention further provides an imposition proofing printing sheet punch or punching method for making a paper sheet as defined above. Further aspects and preferred features may be found in the claims.

[0019] Embodiments according to the invention may be advantageous in that they simplify the loading of imposition sheets in an imposition proofing printer while retaining a high level of precision at different humidity levels. The shape and position of the registration openings can permit the user to quickly and reliably align a sheet in a printer's feed path, and linking of stop deployment and roller disengagement mechanisms can further simplify this operation. The alignment can therefore take place quickly and easily without requiring the operator to thread a number of holes onto a tractor feed mechanism. The shape and position of the registration openings also allows the alignment to take place independent of variations in ambient humidity. As a result, humidity-

based errors can be reproducibly accounted for, and their effects minimized. Embodiments of the invention are further advantageous in that the printer and printable sheets need only employ a single pair of stops and registration openings to achieve a high degree of alignment.

[0020] An embodiment of the invention will now be described by way of example only, with reference to the accompanying drawings in which:-

Fig. 1 A is a plan view of a printable sheet according to the invention;
Fig. 1B is an enlarged view of a first corner portion of the printable sheet of Fig. 1A showing a first alignment opening,
Fig. 1C is an enlarged view of a second corner portion of the printable sheet of Fig. 1A showing a second alignment opening,
Fig. 2 is a diagrammatic isometric view of a printer feed mechanism according to the invention for printing on the sheet of Fig. 1A,
Fig. 3 is a cross section of the feed mechanism of Fig. 2 along the line labeled 3-3 in Fig. 1;
Fig. 4 is an end view of the feed mechanism of Fig. 2;
Fig. 5 is an isometric view of a first stop rocker for the printer feed mechanism of Fig. 2;
Fig. 6 is a flowchart illustrating a two-sided printing operation on the sheet of Figs. 1A-1C using the feeding mechanism of Fig. 2; and
Fig. 7A is a plan view of a punch suitable for making the printable sheet of Fig. 1A; and
Fig. 7B is an edge view of a punch suitable for making the printable sheet of Fig. 1A.

[0021] Referring to Figs. 1A-1C, a printable sheet 10 according to the invention is a foursided rectangular sheet having a first registration opening 12 and a second registration opening 14. The sheet is made up of a printable area and a series of margin areas, which include the registration openings. In one embodiment, the sheet has a length L of 35 inches and a width W of 42 inches, with a 42 x 30 inch printable area. These dimensions are beneficial in that they allow proofs to be printed for a large number of imposition printing applications.

[0022] The registration openings 12, 14 are positioned to prevent rotation of the sheet 10 relative to a print head path, and are preferably located at the leading edge 16 of the sheet. They can be open-ended openings cut out of the leading edge, or they can be closed-ended holes proximate the leading edge. The separation S between the registration openings is preferably as large as possible, consistent with margins M that define the openings. This large separation helps to reduce any misalignment due to dimensional errors in the openings.

[0023] The registration openings preferably have different widths. The width A of the first opening 12 preferably matches the width of one of two identical and symmetrically disposed registration stops (see Fig. 2), while the width B of the second opening 14 is greater than the width of the stops. This difference allows the sheet to reliably interact with the stops despite differences in humidity that result in expansion and contraction of the sheet. Specifically, the width of the second opening should exceed the width of the first by at least the range of dimensional change that results from changes in humidity under normal operating conditions. Typical dimensional change numbers for paper of the general type used in imposition printing are:

50% to 20%RH -0.1 % in the cross grain direction
50% to 20%RH -0.06% in the grain direction
50% to 80%RH +0.25% in the cross grain direction
50% to 80%RH +0.06% in the grain direction

In one embodiment, the first opening is 0.25 inches wide and the second is 0.75 inches wide to accommodate a +/- 0.25 inch expansion specification for a normal humidity range of 20% to 80%. A 0.5 inch wide second opening is also contemplated for typical imposition applications. Both openings have a depth D of 0.25 inches.

[0024] In another embodiment, the first opening is 0.25 inches wide and the second is 0.50 inches wide to accommodate a +/- 0.125 inch expansion specification for a normal humidity range of 20% to 80%. Both openings have a depth D of 0.25 inches. The separation between the inner edges of the openings is at least 36 inches and preferably 38.5 inches. Thus, in a most preferred embodiment which has been found to have optimum alignment and handling properties, the first registration opening is nominally 0.5 inches wide and 0.25 inches deep, the second registration opening is nominally 0.25 inches wide and 0.25 inches deep, and an inner edge of the first registration opening is nominally separated from an inner edge of the second registration opening by 38.5 inches.

[0025] The faces of the sheet should both be printable using deposited ink drops, such as by ink-jet printing or deposit on demand printing. To this end, the faces can be coated with one or more compositions that enhance the holding of ink, improve the take up of solvent, and/or prevent excessive bleeding on either face or from face to face. The compositions can also be added to the sheet material (e.g., paper) to produce a uniform sheet with deposited ink drop printable characteristics. Anti-cockle agents can also be added to prevent cockling, a repetitive buckling effect, in areas of dense printing. Coatings that prevent solvent from reaching the paper they are applied to are particularly useful in imposition printing applications, because they prevent ink from causing the paper to expand during printing of a first side, resulting in misalignment of the print on the other side. The sheet can also include other treatments to enhance printing using deposited ink drops, such as calendaring. Sheet treatments can improve the print characteristics of a sheet surface, an inner volume within the

paper, or both, with the result that the printing characteristics on the sheet surface are improved. Suitably prepared paper is available, for example, from Dupont.

[0026] Referring to Figs. 1A-2, a printer feed mechanism 20 includes a platen surface 22 with a first hole 24 through which a first registration stop 26 protrudes and a second hole 28 through which a second alignment stop 30 protrudes. The centers of the stops are separated by the nominal separation of the registration openings in the printable sheet at the middle of the humidity range (e.g., 50% humidity), and are slightly offset from a centerline of a feed path 36 to make up for the difference in the widths of the registration openings. A pivoting load lever 32 is connected to a hexagonal shaft 34 that runs under the platen surface. As is conventional, the platen has holes in it to allow a vacuum in a chamber beneath the platen to help hold the sheet in place over the platen.

[0027] Further along the feed path 36 of the printer there is a roller assembly that can be made up of at least one feed roller 40, at least one pinch roller 42, and a disengagement mechanism 44. A number of different types of rollers and disengagement mechanisms are suitable for use with the invention. For example, the rollers can be elastomeric rollers with a resilient, tacky surface, or they can be diamond-coated steel rollers with a fine grit surface. There can be more than one shaft for feed rollers and/or pinch rollers, and each shaft may bear more than one roller. Suitable roller mechanisms are available on printers manufactured by Hewlett-Packard, Calcomp, Mutoh, and other manufacturers. A print head path 46 for a swathing deposited ink drop print head is located between the platen 22 and the roller assembly.

[0028] Referring to Figs. 2-3, the first registration stop 26 is part of a first spring-loaded pivoting registration stop rocker 50. This rocker includes a bearing surface which is pressed onto the hexagonal shaft 34 by a spring, such that rotation of the shaft by the load lever 32 lifts the first registration stop up through the first hole 24. The second registration stop 30 forms part of a second spring loaded pivoting registration stop rocker, which is similarly situated with respect to the hexagonal shaft.

[0029] Referring to Fig. 4, the roller disengagement mechanism 44 can be linked to the stop retraction mechanism. The link between the two mechanisms can take on a number of forms, such as linkages, belts, gears, or any other suitable mechanism. The two mechanisms can also be driven by solenoids and sequenced electronically, such as by a microprocessor.

[0030] In one embodiment, the roller disengagement mechanism includes a second hexagonal shaft that separates the rollers by a cam action, similar to the cam action that engages and disengages the stops. In this embodiment, the two hexagonal shafts are linked by a four-bar linkage made up of a portion of the handle 32, a linking member 52, and a radial member 54 attached to the second hexagonal shaft.

[0031] Referring to Figs. 1A, 1B, 1C, and 5, the stop rocker 50 includes a pivot 60, a bearing surface 62, and a stop 64. In one embodiment, the stop is T-shaped with the trunk of the "T" facing toward the roller mechanism. This protrusion is slightly smaller than the first registration opening 12 in the printable sheet 10, so that the two engage readily. The rear stop area formed by the underside of the top of the "T" is the surface against which the portions on either side of the leading edge surrounding the registration openings of the sheet butts. It should be just wide enough to hold the paper under all rated humidity conditions. For example, where the smaller registration opening is a 0.25 inch square, all of the segments of the "T" in the registration stop can be 0.22 inches wide, with the trunk of the "T" being a 0.22 inch square and the top of the "T" being 1 to 1.25 inches long overall. The top surface of the stop slopes downward toward the roller mechanism when it is engaged (e.g., sloped by an angle Ø of about 85 degrees from vertical). This slope helps to prevent the sheet from becoming caught on the leading edge of the stop or the trailing edge of its hole as it is advanced by the rollers.

[0032] Referring to Figs. 1-6, imposition printing on a printable sheet 10 using the printer feed mechanism 20 will now be described. Before inserting a printable sheet, the feed mechanism disengages the feed and/or pinch rollers (step 102). This can take place in response to actuation of the user of a mechanical lever or in response to an electrical signal.

[0033] The feed mechanism also deploys the registration stops 26, 30 (step 104). This operation can occur simultaneously with the disengagement of the roller mechanism (step 102), such as may take place where the mechanism is mechanically linked, or at least in unison (i.e., in a coordinated, but not necessarily simultaneous, fashion) with the disengagement of the roller mechanism, such as may take place when the two operations are sequenced by a microprocessor. The two operations can also proceed independently, in any order.

[0034] The operator then inserts the printable sheet into the feed mechanism and butts the ends of the registration openings up against the ends of the registration stops to align the sheet in the feed path (step 106). The feed mechanism then engages the rollers (step 108) and retracts the stops (step 110). These two operations can take place simultaneously, in unison, or independently, although it appears to be preferable to engage the vacuum hold through the platen before engaging the rollers and to retract the stops after engaging the rollers. With the rollers engaged, the printer can employ its optical sensors to determine the positions of the edges of the paper, and then begin printing on the first side of the sheet, as the rollers feed the sheet back out of the feeding mechanism over the retracted stops (step 112).

[0035] Once the first side has been fully printed, the rollers are disengaged (step 114), the sheet is removed

and reversed (step 116), and the stops are deployed (step 118). Some or all of these operations can occur simultaneously, in unison, or independently. For example, the sheet may be removed from the printer after the rollers are disengaged, which takes place simultaneously with the deployment of the stops.

[0036] The operator initiates printing of the second side by inserting the printable sheet into the feed mechanism and butting the ends of the registration openings up against the ends of the registration stops to align the sheet in the feed path (step 120). The feed mechanism again engages the rollers (step 122) and retracts the stops (step 124) either simultaneously, in unison, or independently. With the rollers engaged, the printer can begin printing of the second side of the sheet (step 126). The process can then be repeated for further sheets.

[0037] Referring to Figs. 7A and 7B, suitable paper can be made using a punch 70. The punch includes a platen 72, a rear stop 76, an end stop 78, and a pair of punch towers 80, 82. The punch towers each include an actuator 84, such as a pneumatic cylinder, solenoid, lever, or motor and reduction gearing. Mounted on an output shaft of each actuator are a collar 86, a spring 88, a stripper plate 90, and a punch 92. Below and in alignment with the punch on each tower is a die opening 94 in the platen. The shape of the die openings and the shape of the punches both match the shape of the registration openings in the printable sheet, and the position of the die openings and the position of the punches with respect to the rear stop and the end stop match the position of the registration openings with respect to the registration edge of the printable sheet and one of the edges adjacent the registration edge.

[0038] Sheets are punched by first butting the desired registration edge of a stack of uncut sheets against the rear stop and an adjacent edge against the end stop, and then operating the actuator. This causes the stripper plate to first engage the top of the stack and hold the paper. The spring then begins to compress, allowing the punch, which is attached to the collar, to move downward and slide at least partially into the die openings and thereby cut the registration openings in the stack of sheets. In one embodiment, preferably no more than ten sheets should be cut at one time, to achieve precisely defined registration openings.

[0039] The present invention has now been described in connection with a number of specific embodiments thereof. However, numerous modifications which are contemplated as falling within the scope of the present invention should now be apparent to those skilled in the art, and the examples are not to be construed as limiting the scope of the claims. All features disclosed herein may be provided independently unless otherwise stated and, as will be apparent, preferred features of one aspect may be applied to other aspects. The appended abstract is incorporated herein by reference.

Claims

1. An deposited ink drop imposition proofing print sheet, comprising:

a first rectangular deposited ink drop printable face having a periphery defined by an ordered series of first, second, third, and fourth edges of the imposition proofing print sheet, the first face including an added deposited ink drop print-enhancing composition or having properties resulting from a deposited ink drop print-enhancing treatment, preferably coated with a deposited ink drop print-enhancing composition to achieve the properties,

a second rectangular deposited ink drop printable face opposite the first face and also having a periphery being defined by the first, second, third, and fourth edges of the imposition proofing print sheet, the second face including an added deposited ink drop print-enhancing composition or having properties resulting from a deposited ink drop print-enhancing treatment, preferably coated with a deposited ink drop print-enhancing composition to achieve the properties,

wherein the sheet defines a first registration opening, the first registration opening being located closer to the first sheet edge than to the third sheet edge and closer to the second sheet edge than to the fourth sheet edge, and

wherein the sheet defines a second registration opening, the second registration opening being located closer to the first sheet edge than to the third sheet edge and closer to the fourth sheet edge than to the second sheet edge.

2. A double-sided ink-jet printable friction-feed imposition proofing sheet having a printable area occupying substantially the width of the sheet and first and second registration openings adjacent a first (leading) edge of the sheet.

3. A deposited ink drop imposition proofing print sheet, comprising:

a first rectangular deposited ink drop printable face having a periphery defined by an ordered series of first, second, third, and fourth edges of the imposition proofing print sheet,

a second rectangular deposited ink drop printable face opposite the first face and also having a periphery being defined by the first, second, third, and fourth edges of the imposition proofing print sheet, and

registration means for receiving a pair of rectangular spaced-apart stops.

4. The imposition proofing print sheet of any preceding claim wherein the registration means are dimensioned to interact with the rectangular spaced-apart stops in a manner that prevents rotational misalignment over a predetermined humidity range, or wherein the registration openings are dimensioned to interact with spaced apart registration pins to prevent rotational misalignment over a predetermined humidity range.

5. The imposition proofing print sheet of any preceding claim wherein the width of the second registration opening, in a direction parallel to the first edge of the imposition proofing sheet, is greater than the width of the first registration opening, in a direction parallel to the first edge of the imposition proofing sheet.

6. The imposition proofing sheet of any preceding claim wherein the width of the second registration opening exceeds the width of the first registration opening by about the range of dimensional change with humidity of the sheet between the first and second registration openings in a direction parallel to the first edge of the imposition proofing sheet.

7. The imposition proofing print sheet of any preceding claim wherein the sheet defines the first registration and second registration openings as openings that begin at the first sheet edge.

8. The imposition proofing print sheet of any preceding claim wherein the first and third edges are at least about lm (42 inches) in length, and wherein the second and third edges are at least about 3/4m (30 inches) in length and wherein the first and second registration openings are peripheral to a printable area of about 1m by 3/4m (42 inch x 30 inch) of the sheet, preferably wherein an inner edge of the first registration opening is nominally separated from an inner edge of the second registration opening by at least 36 inches, most preferably wherein the first registration opening is nominally 0.5 inches wide and 0.25 inches deep, the second registration opening is nominally 0.25 inches wide and 0.25 inches deep, and an inner edge of the first registration opening is nominally separated from an inner edge of the second registration opening by 38.5 inches.

9. The imposition proofing print sheet of any preceding claim wherein the first and second registration openings are rectangular.

10. The imposition proofing print sheet of any preceding claim wherein the first and second faces are coated with the deposited ink drop print-enhancing composition.

11. An imposition proofing printer adapted to register with and to print a proofing sheet according to any preceding claim.

12. An imposition proofing printer, comprising:

at least one feed roller located along a printing substrate feed path and having an axis of rotation,
at least one pinch roller located along the printing substrate feed path and having an axis of rotation parallel to the axis of rotation of the feed roller,
a disengagement mechanism linked to one or more of the feed roller and the friction feed drum,
a first retractable registration pin having an alignment surface located along the printing substrate feed path, and
a second retractable registration pin having an alignment surface located along the printing substrate feed path and being spaced from the first retractable registration pin in at least a direction parallel to the axis of rotation of the feed roller.

13. The imposition proofing printer of claim 12 further including a mechanism linking the first and second retractable pins and the disengagement linkage.

13. A friction-feed imposition proofing printer having first and second retractable registration pins spaced apart across the width of the feed path for registering with preformed registration openings of paper to be printed to align the paper

14. The imposition proofing printer of any of Claims 10 to 13 wherein the substrate feed path is at least 30 inches wide.

15. An imposition printing method, comprising the steps of:

disengaging rollers from a print substrate feed path,
deploying a pair of registration stops in the print substrate feed path,
aligning a print substrate in the print substrate feed path by engaging openings in the print substrate with respective ones of the pair of stops,
engaging the rollers with the print substrate, and
retracting the registration stops from the print substrate feed path.

16. The method of claim 15 wherein the steps of

disengaging and deploying take place in unison, and wherein the steps of engaging and retracting deploying take place in unison.

17. An imposition printing method, comprising the steps of:

aligning a print substrate in the print substrate feed path by engaging one or more registration openings in the print substrate with respective ones of a pair of rectangular stops,
printing on a first side of the print substrate,
turning the substrate over,
again aligning the print substrate in the print substrate feed path by engaging one or more registration openings in the print substrate with respective ones of the pair of rectangular stops,
printing on a second side of the print substrate.

18. An imposition proof printing method comprising aligning preformed registration openings adjacent a leading edge of double-sided imposition proofing printing paper in a first orientation with registration pins of a friction feed imposition proofing printer, friction feeding the paper through the printer to print the first side of the paper, the method preferably further comprising aligning the paper in a second orientation and friction feeding the paper to print the second side of the paper.

19. The method of any of Claims 15 to 18 wherein the steps of aligning employ only two registration openings.

20. A punch adapted to produce said registration openings to produce an imposition print proofing sheet according to any of Claims 1 to 10.

21. A punch according to Claim 20 having alignment means for defining the position of at least a leading edge of paper to be punched and punch means for punching said registration openings at predetermined positions with respect to the leading edge.

22. A punch for imposition printing paper, comprising:

one or more punch elements defining at least two outer alignment edge cutting edges,
a rear stop at least generally perpendicular to the two alignment surfaces,
an end stop at least generally parallel to the two alignment surfaces,
one or more die elements defining at least two outer die opening edges, and
an actuation mechanism operatively connected relative to the one or more punch elements and the one or more die elements.

23. A method of making a deposited ink drop imposition printing sheet, comprising:

providing a rectangular imposition proofing sheet including a first printable face having periphery defined by an ordered series of first, second, third, and fourth edges of the imposition proofing print sheet, and a second rectangular deposited ink drop printable face opposite the first face and also having a periphery being defined by the first, second, third, and fourth edges of the imposition proofing print sheet, and
cutting registration means for receiving a pair of rectangular spaced-apart stops along the first edge of the imposition proofing sheet.

24. The method of claim 23 wherein the step of cutting is applied to a maximum of ten sheets.

25. The method of claim 33 wherein the step of cutting defines a pair of registration openings of different widths.

26. Use of a sheet of paper adapted to be ink-jet printed on both sides and having predefined registration openings at or adjacent a leading edge thereof in the printing of an imposition proof by means of a friction feed printer.

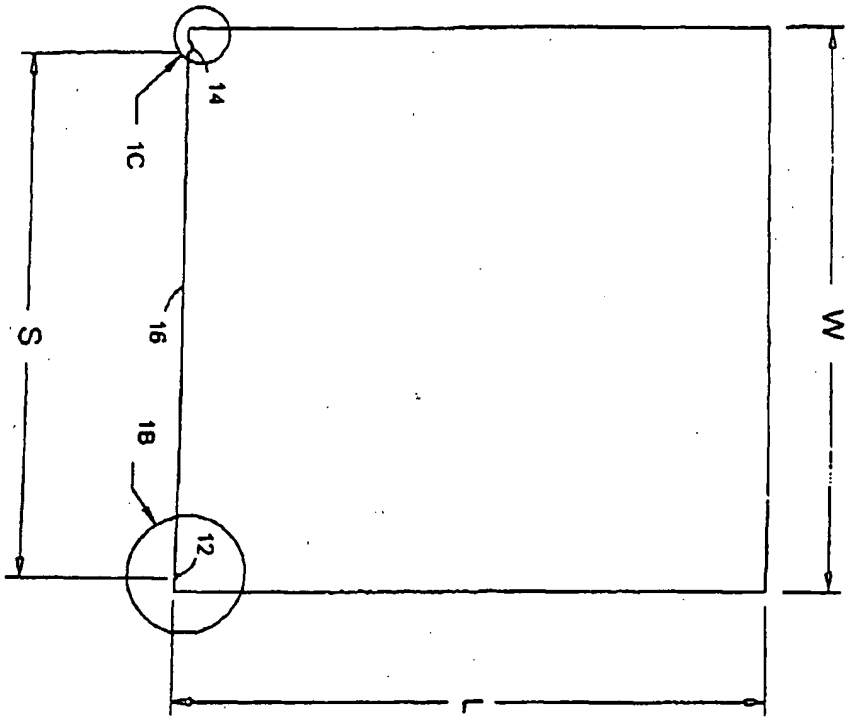

FIG. 1A

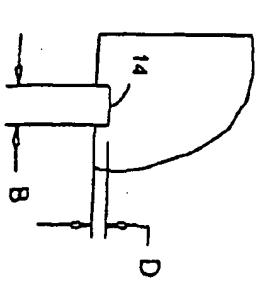

FIG. 1C

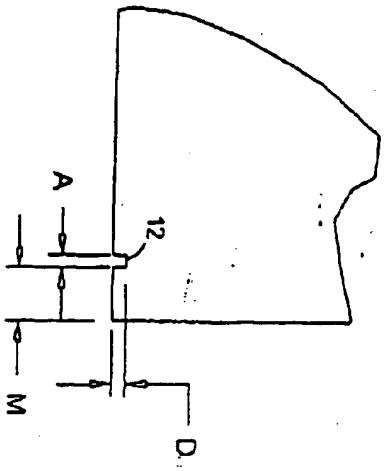

FIG. 1B

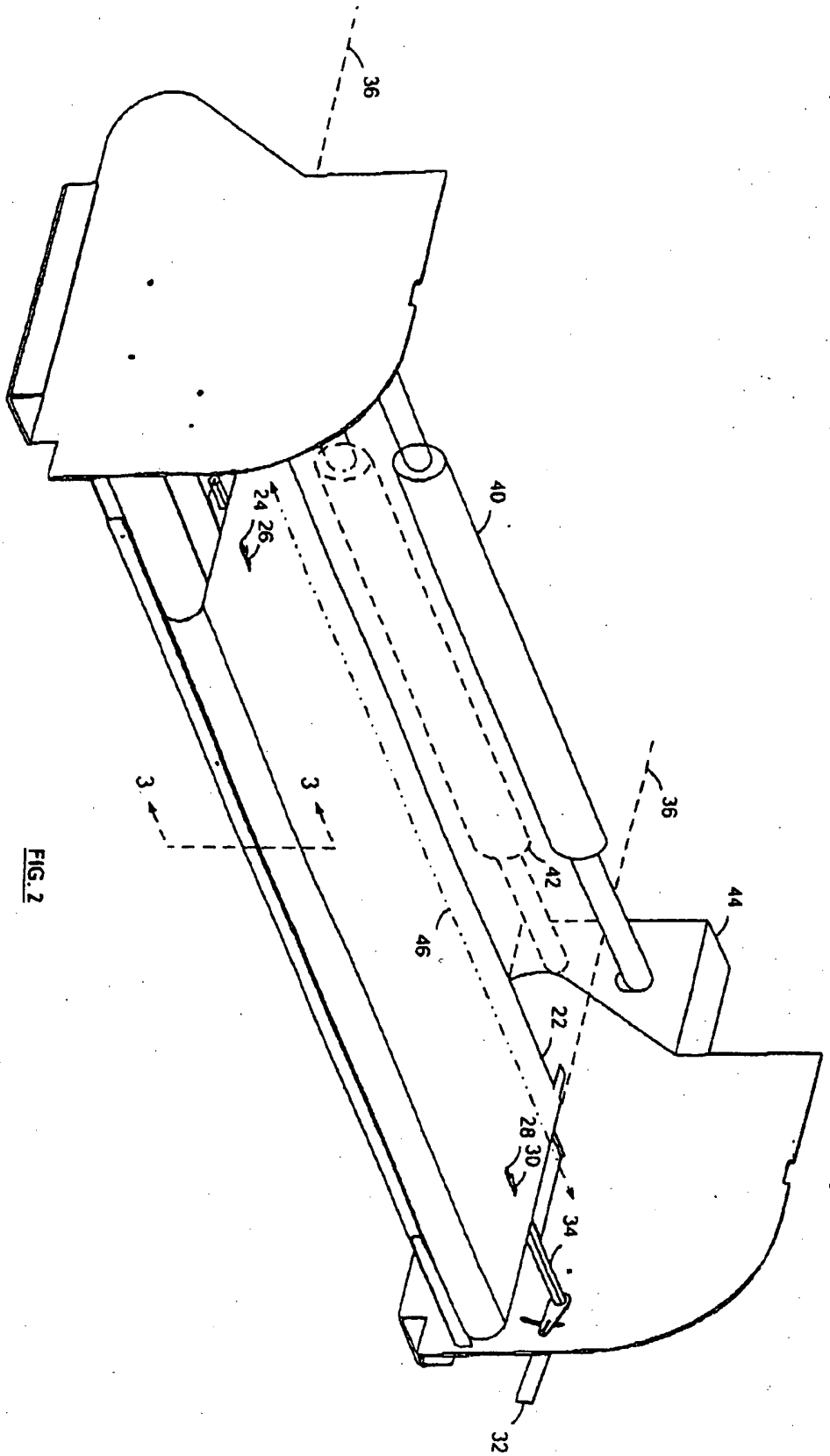

FIG. 2

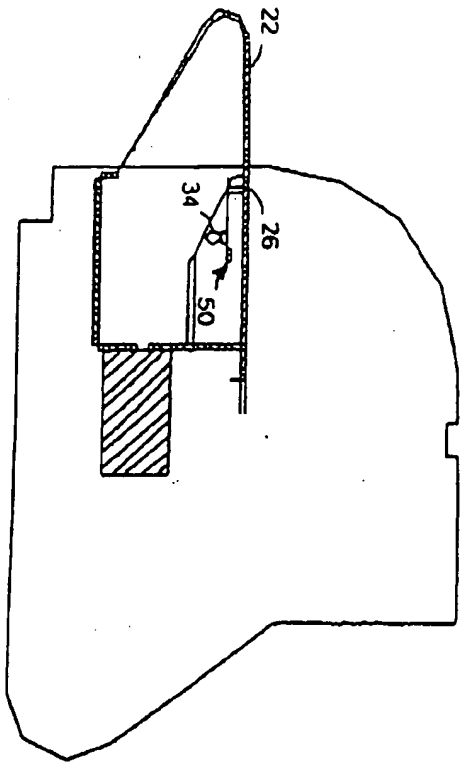

FIG. 3

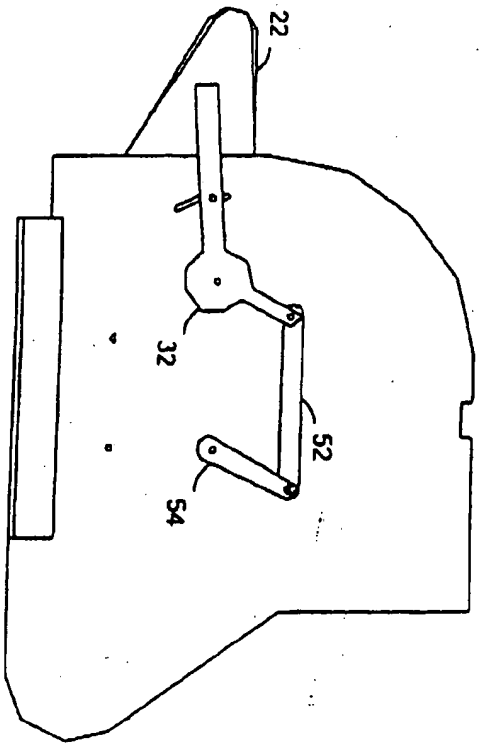

FIG. 4

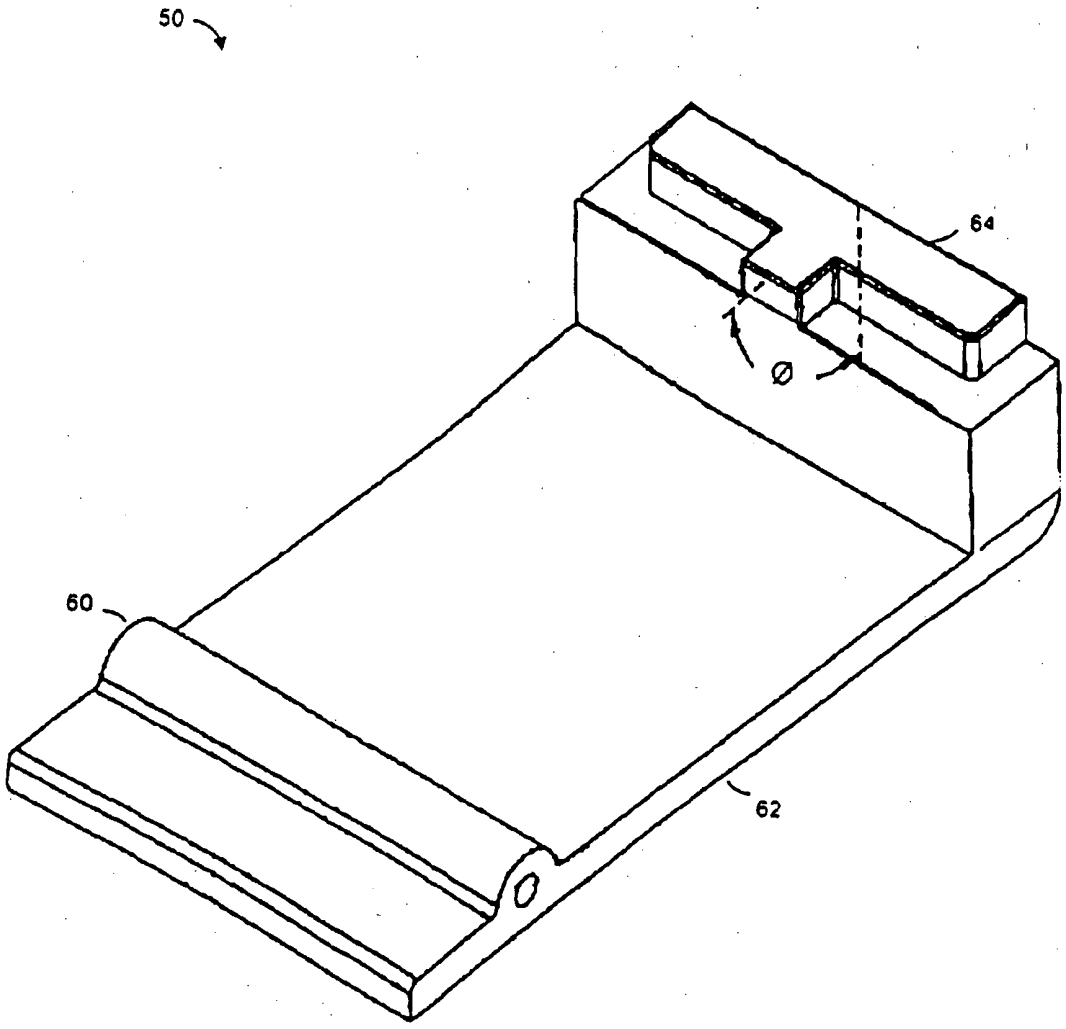

FIG. 5

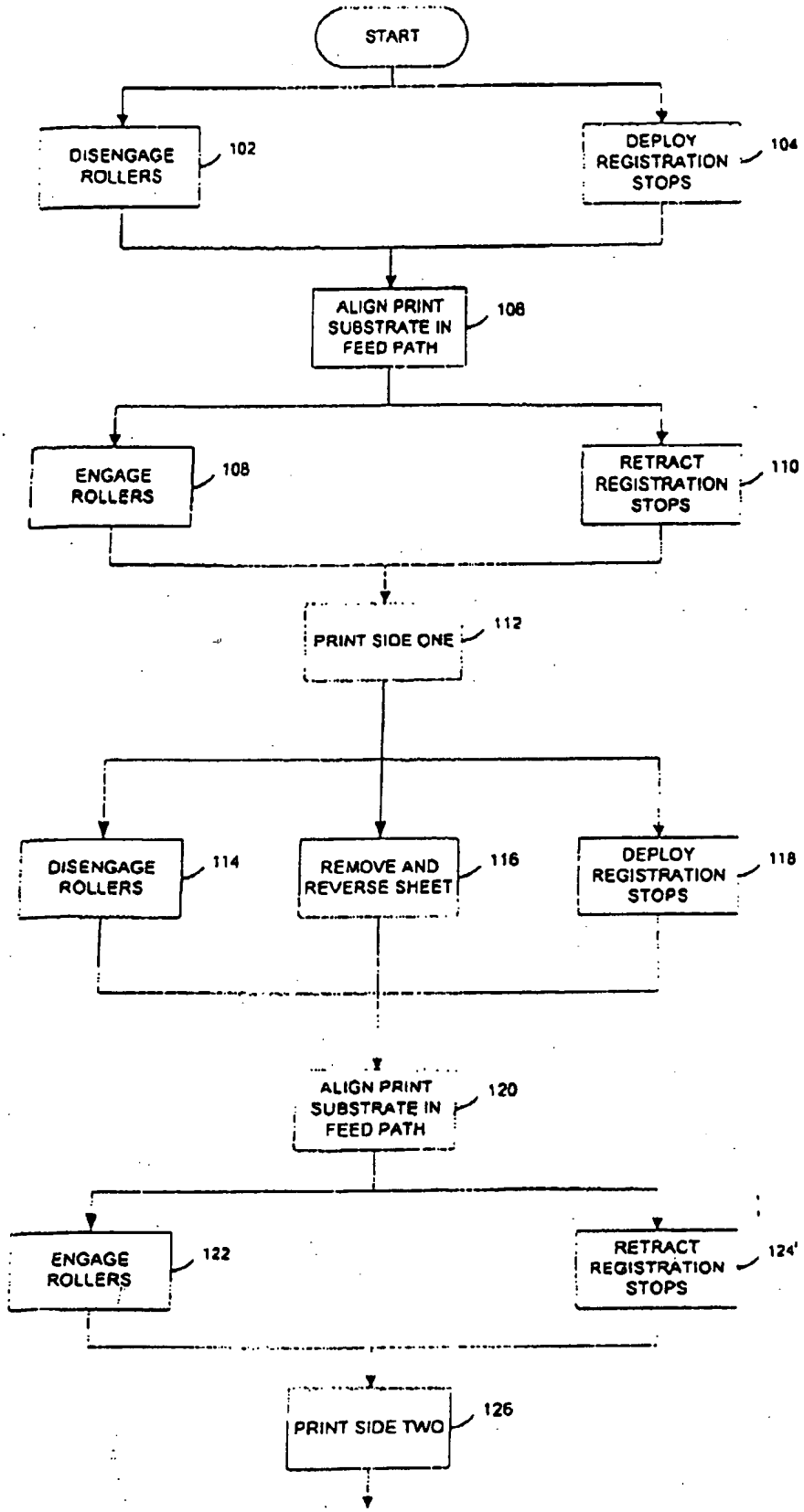

FIG. 6

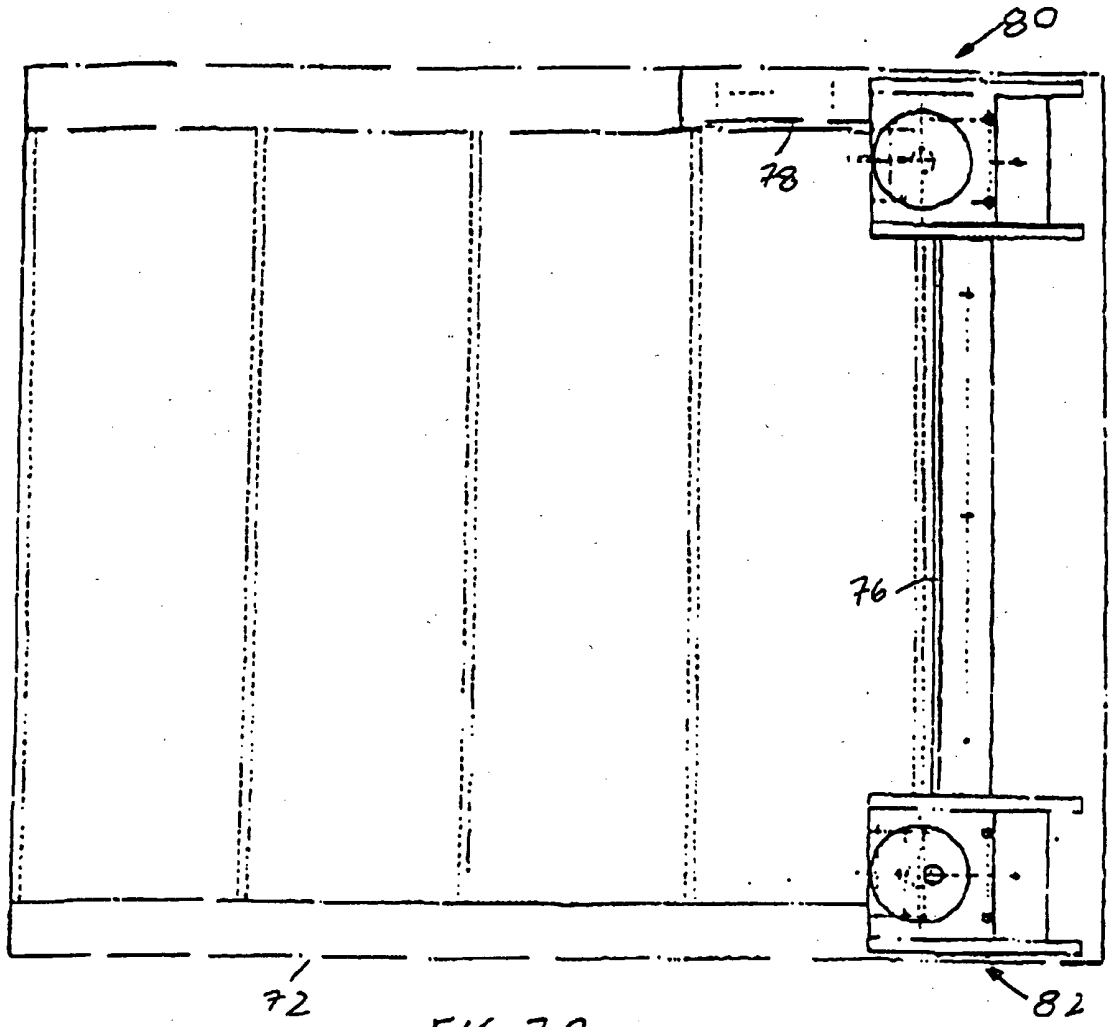

FIG. 7A

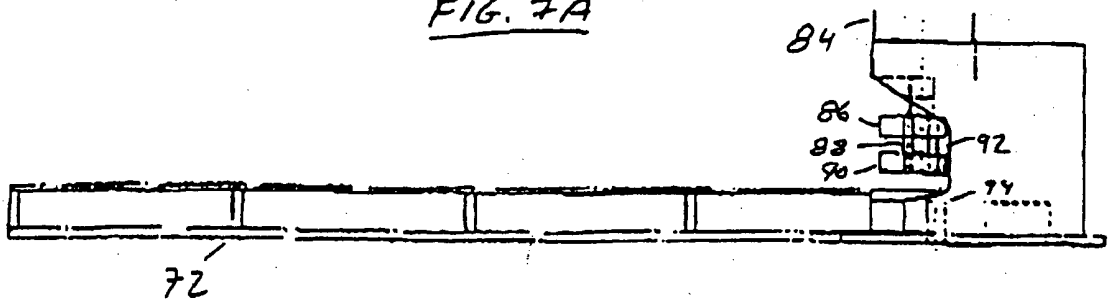

FIG. 7B

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06.09.2000 Bulletin 2000/36

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03.08.1999 US 366456

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(54) Imposition proofing

(57) An imposition proofing printing sheet, printer, punch, and method are disclosed which make use of suitable registration openings in paper to enable accurate and simple friction feeding, as opposed to the conventional method in imposition proofing of tractor an imposition proofing sheet. This may facilitate handling without compromising quality.

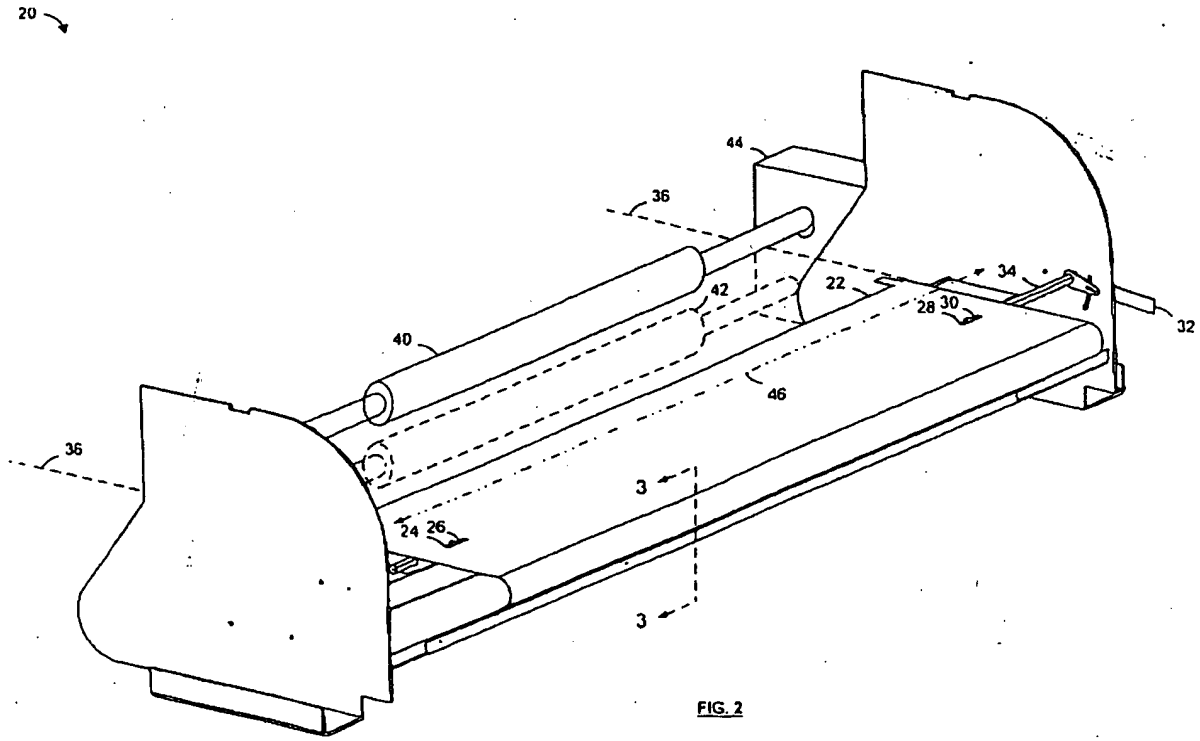

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 1800

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B41J
B65H
B26F

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 November 2000	Wehr, W

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